US Environmental Protection Agency

Second Five-Year Review Report

For

Kerr-McGee Chemical Corp. (Soda Springs) Superfund Site

Caribou County, Idaho

September 2007

US Army Corps of Engineers®
Seattle District

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PREPARED BY:
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Seattle, Washington

PREPARED FOR:
U.S. Environmental Protection Agency, Region 10
Seattle, Washington

Approved by:

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Environmental Cleanup Office
U.S. EPA, Region 10

9/28/07
Date

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Attachments

List of Acronyms

ARAR	Applicable or relevant and appropriate requirements
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CD	Consent Decree
COC	Contaminants of Concern
EPA	United States Environmental Protection Agency
FML	Fabric Membrane Liner
KMCC	Kerr-McGee Chemical Corporation/Tronox, Inc.
MCL	Maximum Contaminant Levels
µg/L	Micrograms per liter
NCP	National Contingency Plan
NPL	Superfund National Priorities List
O&M	Operation and Maintenance
OU	Operable unit
PRP	Potentially Responsible Party
RAO	Remedial Action Objectives
RBC	Risk Based Concentrations
RD	Remedial Design/Remedial Action
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
S-X	Solvent Extraction
TBP	Tributyl phosphate
TPH	Total Petroleum Hydrocarbon
USACE	U.S. Army Corps of Engineers

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Executive Summary

The Kerr-McGee Chemical Corporation (KMCC) Superfund Site in Soda Springs, Idaho consists of a single operable unit. KMCC (now Tronox, Inc.), operated a vanadium production facility beginning in March 1964. The facility was placed on the National Priorities List (NPL) on October 4, 1989, and a Record of Decision (ROD) was signed on September 28, 1995.

The waste by-products of vanadium production (calcine, roaster, and solvent extraction (S-X) solids) were transported to three different ponds using water. The carrier water interacted with the solids in the unlined ponds and contaminants leached into the local groundwater. The groundwater beneath and downgradient from the site exists predominantly within the basalt sequences.

The six chemicals of concern (COCs) identified in the Risk Assessment (EPA, 1993) include arsenic, manganese, molybdenum, tributyl phosphate (TBP), total petroleum hydrocarbons (TPH), and vanadium.

The Remedial Action for the site included:

- Elimination of uncontrolled liquid discharges from the site;
- Landfilling solids from the ponds at an on-site landfill;
- In-place capping of the wind-blown calcine, roaster reject, reject fertilizer, and active calcine tailings during 2000 and 2001;
- Semi-annual groundwater monitoring to determine the effectiveness of source control measures in achieving risk-based groundwater performance standards, and;
- Establishment of institutional controls in affected off-site areas to prevent ingestion of groundwater for as long as the groundwater exceeds the risk-based concentrations.

A ROD Amendment was signed on July13, 2000, which changed the remedy for the reuse/recovery of the calcine solids. The final remedy selection included capping of the calcine, roaster reject, and rejected (off-spec) fertilizer.

Two issues were identified during the first Five-Year Review. The change in the Maximum Contaminant Level (MCL) for arsenic and repair problems at the calcine cap location. No actions were taken to address the change in the MCL for arsenic. Over seeding, weed control, and fence repair work were performed to address damage to the calcine cap that occurred during winter storms in the first year.

Since the first Five-Year Review, there have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy. The calcine cap was repaired and erosion is no longer an issue. Semi-annual monitoring of the groundwater continues. Groundwater monitoring data reveal, after initially decreasing, trends for a number of COCs have been relatively flat since the late 1990s and remain above risk-based cleanup goals identified in the ROD. In some cases, trends for certain COCs at specific monitoring wells have been increasing over the last several years. Because groundwater cleanup goals have not been achieved within

the 10 year period predicted in the ROD, and trends for some COCs are flat or upwards at some wells, additional assessment of the practicability of the remedy in meeting the cleanup goals is recommended.

No changes in standards or toxicity factors for the COCs have been made that would affect the protectiveness of the remedy.

This is the second Five-Year Review for the Kerr-McGee Site. The assessment of this Five-Year Review found that the remedies were constructed in accordance with the requirements of the ROD; however a protectiveness determination of the remedy cannot be made until further information is obtained. This is because levels of COCs in groundwater and surface water remain above cleanup goals and recent trends call into question the likelihood of achieving those goals in the foreseeable future. Further information will be obtained by taking the following actions:

- Evaluate practicability of remedy in achieving cleanup goals;
- Evaluate adequacy of current groundwater monitoring network for identifying the offsite migration of COCs;
- Assess whether current groundwater and surface water performance standards are still applicable; and
- Work with the laboratory providing analytical services to reduce the groundwater detection and reporting limits to less than the MCL for arsenic.

It is expected that these actions will take approximately fifteen months to complete, at which time a determination of protectiveness will be made.

Five-Year Review Summary Form

SITE IDENTIFICATION

Site name *(from WasteLAN)*: Kerr-McGee Chemical Corporation (Soda Springs)

EPA ID *(from WasteLAN)*: IDD041310707

Region: 10	**State: ID**	**City/County: Soda Springs (1 mile north)/Caribou**

SITE STATUS

NPL status: √ Final • Deleted • Other (specify)

Remediation status (choose all that apply): • Under Construction √ Operating • Complete

Multiple OUs?* • YES √ NO	**Construction completion date:** 9 / 26 / 2001

Has site been put into reuse? • YES √ NO

REVIEW STATUS

Lead agency: √ EPA • State • Tribe • Other Federal Agency _____

Author name: Kathryn Carpenter / Richard Garrison

Author title: Project Manager / Geologist	**Author affiliation: USACE Seattle District**

Review period:** 6 / 1 / 2007 to 9 / 28 / 2007

Date(s) of site inspection: 6 / 21 / 2007

Type of review:

√ Post-SARA • Pre-SARA • NPL-Removal only
• Non-NPL Remedial Action Site • NPL State/Tribe-lead
• Regional Discretion

Review number: • 1 (first) √ 2 (second) • 3 (third) • Other (specify) _____

Triggering action:

• Actual RA Onsite Construction at OU #____ • Actual RA Start at OU#____
• Construction Completion √ Previous Five-Year Review Report
• Other (specify)

Triggering action date *(from WasteLAN)*: 9 / 30 / 2002

Due date *(five years after triggering action date)*: 9 / 30 / 2007

* ["OU" refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form, cont'd.

Issues:

1) Concentrations of contaminants of concern in groundwater and surface waters remain above RBCs and are exhibiting either flat or upward trends.

2) The routine laboratory reporting limit for arsenic in groundwater is greater than the MCL.

Recommendations and Follow-up Actions:

Follow-up Actions related to Issue 1)
1) Evaluate practicability of remedy in achieving cleanup goals;
2) Evaluate adequacy of current groundwater monitoring network for identifying the offsite migration of COCs

3) Assess whether current groundwater and surface water performance standards are still applicable

Follow-up Action related to Issue 2)
1) Work with the laboratory providing analytical services to reduce the groundwater detection and reporting limits to less than the MCL for arsenic.

Protectiveness Statement(s):

A protectiveness determination of the remedy cannot be made until further information is obtained. Further information will be obtained by taking the above Follow-up Actions.

It is expected that these actions will take approximately fifteen months to complete, at which time a determination of protectiveness will be made

Other Comments:

1.0 Introduction

1.1 Purpose of the Review

The purpose of Five-Year Reviews is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, Five-Year Review reports identify issues found during the review, if any, and recommendations to address them.

1.2 Authority for Conducting the Five-Year Review

The U.S. Environmental Protection Agency (EPA) prepared this Five-Year Review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) §121 and the National Contingency Plan (NCP). CERCLA §121 states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

EPA interpreted this requirement further in the NCP; 40 CFR §300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

1.3 Who Conducted the Five-Year Review

EPA Region 10 has conducted a Five-Year Review of the remedial actions implemented at the Kerr-McGee Chemical Corporation Superfund Site in Caribou County, Idaho. This review was conducted for the entire site from June 2007 through September 2007. This report documents the results of the review.

The U.S. Army Corps of Engineers (USACE) provided support to EPA in the data analysis and evaluation of remedy protectiveness for this Five-Year Review. The USACE also conducted the site inspection on behalf of EPA.

1.4 Other Review Characteristics

This is the second Five-Year Review for the Kerr-McGee Chemical Corporation Superfund Site. The triggering action for this review was the first Five-Year Review completed in September 2002. The Five-Year Review is required by statute because the ROD was signed after October

17, 1986 and hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure.

2.0 Site Chronology

Table 1 presents a brief summary of site events:

Table 1 Chronology of Site Events

Event	Date
Initial Discovery of Problem	April 1981
Preliminary Assessment by State of Idaho	May 1985
Site Investigation	April 1988
NPL Listing	October 4, 1989
Remedial Investigation/Feasibility Study Completed	September 25, 1995
ROD Signature	September 28, 1995
Remedial Design Start	December 16, 1996
Remedial Design Completed	July 17, 1997
Remedial Action Start (Construction Start)	July 17, 1997
Consent Decree with PRP	August 21, 1997
ROD Amendment	July13, 2000
Construction Complete	September 26, 2001
Vanadium plant dismantled	May 2002
First Five-Year Review Completed	September 30, 2002
Constructed north infiltration basins	October 2002
Fertilizer building dismantled	June 2003
Reclaim Stormwater Runoff Ponds	October 2003
Reclaim 5-Acre Ponds	October 2004
Constructed south infiltration basins & snow fencing	November 2004
KMCC Purchased adjacent property	2004
Kerr McGee chemical division reincorporates as Tronox	March 2006

3.0 Background

3.1 Physical Characteristics

The site is located within the Bear River Basin which is characterized by broad, flat valleys with a few scattered topographic features including cinder cones, rhyolitic domes, and uplifted fault blocks. The site lies in a valley at approximately 6,000 feet elevation. The valley is bordered by northwest trending mountain ranges reaching approximately 8,000 feet in elevation.

The northern boundary of the Bear River Valley drainage basin is formed by the Blackfoot Reservoir, located approximately thirteen miles north of the KMCC site. Surface drainage in the valley is predominantly to the south. Natural springs are important hydrologic features of the basin, and emerge at several locations to the ground surface as result of discharge from the

underlying groundwater aquifer. There are no known floodplain zones, endangered species, or historical or archeological sites in the immediate vicinity of the site. There is a small wetland (Finch Spring/Pond) about one mile south of the site.

3.2 Land and Resource Use

The KMCC site is located about three miles north of Soda Springs, Idaho, on State Route 34. The site has expanded from its original 50 acres to about 547 acres in size. The area surrounding the site is agricultural, primarily grain crops. Directly across the highway is the large Monsanto Corporation phosphate processing plant. The entire area north of Soda Springs is rural in nature (Figure 1). The Soda Springs facility is now owned and operated by Tronox, Inc., where lithium manganese oxide used in manufacturing lithium manganese batteries is produced.

3.3 History of Contamination

Kerr-McGee Chemical Corporation operated a vanadium production facility in Caribou County beginning in March 1964. Kerr-McGee used large unlined man-made ponds and impoundments on site to manage their process wastes. The two main ponds experienced significant containment failures, including the loss of approximately two and one half million gallons from the S-X pond in April 1981. A site investigation conducted in April 1988 identified hazardous substances in waste ponds on site including arsenic, cadmium, chromium, lead, and organic compounds. Pond failures totaling approximately 750,000 gallons were documented in September and November, 1989.

The KMCC Soda Springs Plant, was placed on the National Priorities List on October 4, 1989. The Remedial Investigation and Feasibility Studies were completed by KMCC on June 15, 1995. The Record of Decision was signed on September 28, 1995, and a Consent Decree implementing the remedy required by the ROD was entered by the court on August 21, 1997. The vanadium plant was closed in January 1999 because of economic considerations and fully dismantled by June 2002.

The footprint of the vanadium plant was covered with limestone fines and recontoured to provide positive drainage away from the site of the former plant. The fertilizer plant, constructed in 1997 to reuse/recycle calcine tailings and roaster rejects, was shut down in the second quarter of 2002 and subsequently dismantled. The surface footprint was cleaned and regraded.

The vanadium processing created three different waste streams which were liquefied for transport and were originally discharged to unlined ponds on the property (Figure 2). The three waste stream ponds are identified as:

- Calcine Ponds
- Scrubber Pond
- S-X Pond

Calcine is a generic term for the fine-grained, black, sandy material which is the major by-product of the vanadium production. Calcine tailing was originally impounded on the west side of the plant for the first ten years of operation. Then in 1973, this impoundment was covered

with topsoil and seeded to prevent wind blown fugitive dust. The calcine tailings were then shifted to diked ponds on the eastern side of the plant.

The waste by-products of vanadium production (calcine, roaster, and S-X solids) were transported to the three different ponds using water. The carrier water interacted with the solids in the unlined ponds and contaminants leached into the local groundwater. Six COCs were identified through the risk assessment process:

- Arsenic
- Manganese
- Molybdenum
- Vanadium
- Tributyl phosphate (TBP)
- Total Petroleum Hydrocarbon (TPH)

The groundwater beneath and downgradient from the site exists predominantly within the basalt sequences. The underlying Salt Lake Formation bounds the hydrogeology about 230 feet below ground surface. The basalt sequence is comprised of five basalt flows. At the KMCC site the hydraulic conductivities are all relatively similar. Water quality and aquifer test data indicate that the entire thickness of saturated basalt is in relatively good vertical hydraulic connection over the entire KMCC site. Faults in the basalt flows represent zones of increased transmissivity and help to explain the flow of contaminants downgradient.

Groundwater monitoring wells are screened at two levels: shallow (15-40 feet below ground surface [bgs]), and deeper (125-150 feet bgs). The regional groundwater flow is north to south; however the flow at the KMCC site tends towards the west because of groundwater pumping by the Monsanto plant west of the KMCC site. Once the contaminants enter a fault in the basalt formation the flow follows the easier pathway which is southerly. Groundwater monitoring also indicates some of the groundwater reaches the surface water (Ledger Creek, Big Spring, and Finch Spring). These surface waters are not currently drinking water sources. The groundwater contaminant plume has not changed since the ROD, however, there has been a reduction in the contaminant concentrations.

The contaminants impacted both the groundwater under the facility and surface water downgradient for a distance of about one-half mile. Neither of these sources has been utilized as a potable water source.

3.4 Initial Response

There were no remedial actions taken prior to the signing of the EPA ROD.

3.5 Basis for Taking Action

The basis for taking action and cleaning up this site is from the human health risk associated with the contaminated groundwater originating from the KMCC site. There was also some risk to health from the ingestion/direct contact with roaster reject material having high vanadium concentrations. Both of these sources are addressed in the ROD.

A summary of groundwater concentrations and RBCs is shown in Table 2. The location with the current (as of May 2007) highest concentration is KM-8, located within the site boundaries, southwest of the S-X pond.

Table 2 Concentration of COCs

COC	RBC (µg/L)	Highest Concentration RI/FS to Present (µg/L)	Current (May 2007) Highest Concentration (µg/L)	Location of Current Highest Concentration
Arsenic	10	150	90	KM-8
Manganese	180	8,770	5,000	KM-8
Molybdenum	180	165,000	41,000	KM-8
Vanadium	260	28,600	18,000	KM-8
TBP	180	4,442	590	KM-8
TPH	730	9.5	1.5	KM-8

4.0 Remedial Actions

The remedial action objectives for cleanup of the KMCC site are:

• Prevent the transport of COC to the groundwater from facility sources that may result in COC concentrations in groundwater exceeding Risk Based Concentrations (RBCs) or Maximum Contaminant Limits for drinking water;

• Prevent ingestion by humans of groundwater containing COC having concentrations exceeding RBCs or MCLs;

• Prevent transport of COC from groundwater to surface water in concentrations that may result in exceedences of RBCs or MCLs in the receiving surface water body.

The ultimate goal of the remedial action is to restore groundwater that has been impacted by site sources to meet all RBCs or MCLs for the COCs.

• Prevent the ingestion/direct contact with the roaster reject area material having vanadium concentrations in excess of 14,000 mg/kg.

4.1 Remedy Selection

The ROD for the KMCC site was signed on September 28, 1995, and amended on September 13, 2000. The selected remedy addresses the three pathways of concern: groundwater, roaster reject, and windblown calcine. The ROD remedy selection for groundwater included elimination of uncontrolled liquid discharges from the site (the main source of groundwater impacts), recycling of solid sources (later amended), groundwater monitoring, and institutional controls.

The Remedial Action for the site included:

- Elimination of uncontrolled liquid discharges from the site;
- Landfilling solids from the ponds at an on-site landfill;
- In-place capping of the wind-blown calcine, roaster reject, reject fertilizer, and active calcine tailings during 2000 and 2001;
- Semi-annual groundwater monitoring for the COC to determine the effectiveness of source control; and
- Establishment of institutional controls (deed restrictions, limited access, well restrictions and/or well-head protection) in affected off-site areas to prevent ingestion of groundwater for as long as the groundwater exceeds the risk-based concentrations.

The ROD contains a provision whereby the remedy and/or performance standards are to be reevaluated should contaminant levels in groundwater cease to decline and remain constant at levels higher than the remediation goal over some portion of the plume.

As part of the overall site strategy, though not part of the selected remedy, KMCC developed and submitted to EPA and the State of Idaho a waste minimization/treatment plan to eliminate liquid discharges to groundwater from the facility within two years. The plan included:

- Construction of new lined ponds to contain the main source of groundwater contamination (S-X raffinate that discharged to leaking unlined ponds);
- Construction and operation of a phosphoric acid plant to consume scrubber water and calcine tailings to produce phosphoric acid, ammoniated phosphate, and gypsum fertilizers as marketable products.

A ROD Amendment was signed on September 13, 2000, which changed the remedy for the reuse/recycling of the calcine tailings and roaster reject materials to containment. The fertilizer process did not prove successful and the capping alternative for this waste material, which was included in the feasibility study, was subsequently selected as part of the remedy for this site. The final remedy selection included capping of the calcine, roaster reject, and rejected (off-spec) fertilizer.

All elements of the selected remedy have been completed.

4.2 Remedy Implementation

A Consent Decree (CD) signed by EPA and KMCC was entered by the court on August 21, 1997. In the CD KMCC agreed to implement the ROD and pay past EPA costs for cleaning up the site.

The Remedial Action (RA) took place in two parts because of the ROD Amendment. The initial RA construction activity was the building of an on-site landfill for the S-X and scrubber pond solids. The Remedial Design (RD) was started on December 16, 1996, and completed on July 17, 1997, which implemented the ROD. The construction process began on July 17, 1997, and was functionally completed on October 10, 1997. In accord with the selected remedy, which required

"elimination of the uncontrolled liquid discharges as soon as practicable," the following actions were taken between 1995 and 1997:

1. An on-site landfill was constructed to contain pond solids and the 3 large, unlined ponds were closed. The landfill was constructed with primary and secondary liners, leachate collection, and an engineered cover. Some of the waste in the ponds was saturated so the leachate is collected from a sump in the bottom liner.

2. In the context of continuing operations, Kerr-McGee constructed three lined ponds totaling 20 acres to replace the solvent-extraction (S-X) pond, which was one of three sources of groundwater contamination. Two HDPE-lined 5-acre ponds located north of the facility were constructed in 1996. An additional 10-acre HDPE lined pond was constructed during August 1997. The S-X Pond was also located originally on the west side of the facility. The pond was taken out of service in 1995 and the location filled and planted. Sediments that were excavated from the pond were transported and contained in the on-site landfill with the scrubber pond sediments.

3. The scrubber pond, a second source, was replaced by adding two baghouse systems to plant operations. The scrubber pond was located on the southeast corner of the facility, directly south of the recently capped calcine waste. The scrubber pond was operational for 22 years before the scrubbers were replaced by the baghouse. The sediments from the scrubber pond were removed and combined with the S-X waste sediment and contained on-site in a lined engineered landfill.;

4. The third source, calcine tailings placed in unlined ponds, was to be addressed by excavation and reuse/recycling. Reuse/recycling was found to be impractical and cost-prohibitive, and EPA issued an Amended ROD to change the remedy to another alternative from the Feasibility Study; consolidation and capping.

The ROD Amendment required some additional design work to consolidate the calcine waste and rejected fertilizer into a containment area and then cap. The second RA dealt with the calcine tailings waste stream. This waste stream ceased with the end of vanadium production in 1999 and the design and construction of the cap was initiated. The design of the calcine cap was received by EPA on February 18, 2001, and the design finalized on May 4, 2001. The CERCLA engineered multi-layered cap over the calcine tailings was constructed in 2001 creating a low permeable cap.

The construction of the cap over the calcine landfill began with the regrading of the calcine pile beginning on May 8, 2001. The rejected fertilizer had been returned to the calcine pile in October 2000 in preparation of the capping action. The calcine waste containment area was covered with a medium weight plastic flexible membrane liner (FML), geocomposite, subsoil, and topsoil. Fencing and seeding were the last actions and were completed in August 2000. An EPA construction Preliminary Close Out Report was completed on September 26, 2001, documenting that all the landfill caps were operational and functional and construction of the remedy was complete.

Institutional controls include deed restrictions, limiting access, and well restrictions and/or well-head protection. Implementation of institutional controls included the purchase of the Hopkins property to the south of the facility in order to gain control over the potential use of impacted groundwater. The contamination extends beyond the former Hopkins property and onto City property. The City of Soda Springs currently has restrictions on groundwater development or use that would further limit potential exposure to impacted groundwater. Other impacted properties include the rail road right-of-way and the Highway 34 right-of-way, both of which have tight controls over any potential subsurface explorations that could expose impacted groundwater. To restrict access, the facility is fenced.

In 2002, an infiltration pond was constructed on the north side of the calcine containment area to capture precipitation runoff from the cap. In 2004, another infiltration pond was completed on the south side of the cap. After observing snow drifts piling on the cap and increasing the amount of percolation through the cap, a snow fence was erected along the south side of the facility, in line with the cap.

A plan is being developed to construct a landfill on-site to hold solids from the 10-acre pond constructed in 1997. The 10-acre pond, which is lined, holds residual solids from vanadium plant operations during 1996 to 2000. The pond was permitted by the State in 1995. The 1995 ROD only addressed process wastes going to unlined ponds so this action is being undertaken by Tronox, Inc. outside of the CERCLA process and under IDEQ review. The design for the landfill is complete and is currently being reviewed by IDEQ. The plan includes stabilizing the residual material by mixing it with native soils, placing the material into a new landfill, and covering with a cap similar to the one on the existing calcine landfill.

Groundwater modeling performed for the RI/FS predicted that within ten years of implementation of the selected remedy (source control) levels of vanadium, molybdenum, arsenic, and manganese would achieve the health-based performance standards; levels of TPH and TBP were predicted to achieve the performance standards in 30 years or less (possibly much less if degradation occurs). There is no current estimate of when concentrations of COC will achieve the performance standards.

4.3 System Operations/Operation and Maintenance

Tronox, Inc. is conducting long-term operations and maintenance (O&M) at this site. Currently semi-annual groundwater monitoring is occurring with reports sent to EPA. The cap and ponds are subject to an annual detailed inspection for cracking, animal burrows, settlement, and drainage as well as fence and gate condition. The O&M of the capped waste areas is limited to cap protection, cover crop, fencing, and erosion control. After the first year of operation the scrubber/S-X landfill has not required any significant O&M to maintain the cap. Some O&M of the calcine cap was required because of first year erosion. Some over seeding and weed control was done on the cover crop.

Long-term groundwater sampling has been on-going since the ROD was signed and is continuing. This activity is adequately funded and a budget for the future is in-place by Tronox, Inc., including maintaining a one million dollar bond with EPA. The O&M work on the caps is part of the Tronox, Inc. maintenance budget for the facility.

The visual inspection of the site for this Five-Year Review confirmed that the condition of the caps were still able to provide the protectiveness required by the ROD. Repairs made to the calcine cap to address erosion issues, including replacing topsoil, were effective and no additional work is necessary.

5.0 Progress Since the Last Five-Year Review

Two issues were identified during the last Five-Year Review. The change in the MCL for arsenic and the minor O&M repair problems at the calcine cap location. The MCL for arsenic was changed from 50 µg /L to 10 µg /L in 2001. There is one on-site monitoring well that currently has arsenic concentrations greater than 10 µg/L: 90 µg/L at KM-8. The laboratory analyses used a reporting limit of 10 to 15 µg/L during the second Five-Year Review period.

Some erosion occurred on the calcine cap during the first growing season and was addressed during the First Five-Year Review period. This prompted Tronox, Inc. to construct the infiltration ponds and snow fences. The snow fences were installed to minimize snow drifting into the ponds, thus reducing the amount of water to manage on the site.

6.0 Five-Year Review Process

6.1 Administrative Components

Tronox, Inc. was notified of the initiation of the Five-Year Review in May, 2007. The Five Year Review team was led by William Ryan of Region 10 EPA, Remedial Project Manager for the site with technical assistance provided to EPA by the Seattle District, U.S. Army Corps of Engineers. By 1 June 2007, the review team had been formed and had established the review schedule and its major components including:

- Document Collection and Review
- Data Assessment/Analysis
- Site Inspection
- Interviews and Community Notification and Involvement
- Five-Year Review Report Development and Review.

The due date for this review is 28 September 2007.

6.2 Community Notification and Involvement

In July 2007, EPA sent postcard notices to those listed on EPA's Kerr-McGee Site mailing list and published a public notice in the Caribou County Sun on July 19, 2007 announcing that this FYR was being initiated and explaining how interested parties could get involved. Copies of both are contained in Attachment 2. Only one response was received, a call from an employee of Idaho Department of Fish and Game asking for information about the planned review. Within 30 days of signature on this Report, EPA will publish another notice and summary of the Review.

6.3 Document Review

A review of reports pertinent to this Five-Year Review was conducted. The types of documents reviewed included the ROD (1995), the ROD Amendment (2000), the 2006 monitoring annual data report, available 2007 monitoring data, and the First Five-Year Review (2002). The documents reviewed for this report are listed in Attachment 3.

6.4 Data Review

Monitoring wells that were installed as part of the Remedial Investigation have been sampled semi-annually since October 1991. Since the removal of the S-X Scrubber Pond and the Roaster Scrubber Pond, the concentration of the COCs in the groundwater have been generally decreasing.

Annual precipitation declined after 1997 to about 11.5 inches in 2000, 2001 and 2003, and then has been increasing on average to just over 15 inches annual average in 2005.

Site groundwater level changes over time correlate to some degree to variation in precipitation. Overall, water levels dropped on average 5 to 8 feet between 1997 and October 2001, and then remained at lowered levels in the fall through 2004. Water levels recovered significantly between 2004 and 2006, to within the range of levels observed in 1997. Water levels are typically higher by about 2 to 3 feet in the spring and lower in the fall.

During the First Five-Year Review period, groundwater concentration of several of the COCs decreased significantly, reflecting the continued downward trend since the implementation of the remedial activities in 1997. However, no groundwater or surface water cleanup goals had been met. During this second Five-Year Review period, observation of trends for the COCs have shown that though the concentration of each contaminant decreased significantly when the remedial design began operating, the concentrations of vanadium, molybdenum, and manganese in many wells remain above the RBCs and since the late 1990s have exhibited flattened trends. In some cases, concentrations of these COCs at specific monitoring wells have been increasing over the last several years. The highest concentrations for these three contaminants are located generally downgradient of the former S-X pond and the former scrubber pond. Concentrations remain above the RBCs off-site, though only molybdenum remains above the RBC in springs located further downgradient.

Current evaluation of the long term trends suggest that these contaminants will likely remain present in the groundwater for much longer than twenty years. Concentrations of arsenic at a single well near the former S-X pond remain well above the MCL of 10 µg/L though they have decreased somewhat since implementation of the remedy (calcine cap) in 2001. Arsenic levels at all other wells appear to be at or below the MCL. In all cases, it is difficult to determine whether the arsenic MCL has been (or will be) met because the current reporting limit being used in groundwater analyses is approximately 10 µg/L. Predictions that levels of vanadium, molybdenum, arsenic and manganese would meet health-based performance standards within 10 years of remedy implementation have not been met.

Tributyl Phosphate and TPH concentrations are just above or below their RBCs with no discernable trend suggesting no change for a long period of time. Groundwater modeling

supporting the ROD predicted that these two COCs would achieve performance standards within 30 years (or less) of remedy implementation.

Monsanto has collected surface water data from Big Spring and City Park Spring as part of the remedial action at its adjacent facility. Recent monitoring data (summarized in Table 3) reveal the presence of molybdenum, a contaminant historically associated with the Kerr-McGee facility. A review of available data indicates that concentrations are declining at both locations; however, concentrations are still greater than the RBC of 180 µg/L. No one is relying on these particular locations for drinking water.

Table 3 Summary of Molybdenum Concentrations in Big Spring and City Park Spring from Monsanto Monitoring

Year	Big Spring (µg/L)	City Park Spring (µg/L)
2002	320	300
2003	NA	NA
2004	284	240
2005	250	245
2006	215	197

6.5 Site Inspection

A site inspection was conducted on 25 July 2007. The inspection team consisted of two representatives from USACE, one representative from IDEQ, two Tronox, Inc. representatives, and their consultant. The site inspection checklist is included as Attachment 4. The purpose of this inspection was to assess the protectiveness of the remedy, including the integrity of the caps, the condition of the monitoring wells and restrictive fencing. Tronox, Inc.'s consultant presented a slide show of site history, geological conditions, and remedial activities before leading a site walk. The site inspection was limited to the facility and off-site well locations.

6.6 Interviews

The Tronox, Inc. and IDEQ representatives were the only parties interviewed as part of this Five-Year Review. The interview was conducted as part of the Site Inspection. No other party has shown an interest in this Superfund site.

7.0 Technical Assessment

7.1 Question A: Is the remedy functioning as intended by the decision documents?

No. While the various components of the remedy have been constructed as designed, groundwater monitoring data reveal, after initially decreasing, trends for a number of COCs have been relatively flat since the late 1990s and remain above risk-based cleanup goals identified in the ROD. In some cases, trends for certain COCs at specific monitoring wells have been increasing over the last several years. Because groundwater cleanup goals have not been

achieved within the 10 year period predicted in the ROD, and the trends for some COCs are flat or upwards at some wells, additional assessment of the practicability of the remedy in meeting the cleanup goals is recommended.

The review of the documents, ARARs, risk assumptions, and the results of the site inspection indicates that the remedy has been implemented as intended by the ROD and ROD Amendment. The waste lagoons have all been taken out of service and the process flows into them have ceased. The elimination of uncontrolled releases of process water to groundwater to the various ponds had a positive impact to the concentration of the COCs measured in the groundwater. Capping the waste sludges, calcine, and off-spec fertilizer has also reduced the continued leaching of COCs from the wastes. Capping system performance was improved by erecting a snow fence to minimize snow drifts, thereby reducing the amount of water to manage on the site. Infiltration ponds were added to two sides of the cap to capture runoff water. Plans for additional optimization include construction of an on-site landfill to hold solids from the 10-acre pond. The capping of the contaminated wastes has achieved the remedial objectives to prevent direct contact with contaminants in the waste ponds and the calcine waste that was blown around the site by winds. The caps are being maintained for cap integrity; no burrowing animals were evident, nor were there any deep-rooted plants that had established themselves on the cap. Only a small amount of leachate continues to be produced by the scrubber/S-X pond landfill and is pumped annually.

While capping and other remedial actions intended to achieve the RAO to minimize the migration of contaminants to groundwater have been implemented, levels of COCs in groundwater remain above RBCs, raising some uncertainty as to the ability of the implemented remedy to achieve the goal of restoring groundwater impacted by site sources.

Institutional controls are in place, and much of the property surrounding the offsite contaminated groundwater plume has been purchased and is under control by Tronox, Inc. to ensure the institutional controls remain effective. The City of Soda Springs restricts the development or use of groundwater, which further limits the potential for exposure to COCs from the site. Nothing was observed that would suggest that the institutional controls were ineffective or had been violated. Tronox, Inc. also established and maintains engineering controls in the form of a fence around the facility and the capped landfills to restrict access and protect the integrity of the remedy.

The contaminated groundwater discharges to four different surface streams. These streams are not currently domestic drinking water sources, but have been affected by the KMCC site. Currently Big Spring and Finch Spring have concentrations of the COCs above the RBCs.

7.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

No. There is one change in the ARARs that could affect the site cleanup. The MCL for arsenic has been changed from 50 µg/L to 10 µg/L. There is one on-site monitoring well that currently has arsenic concentrations greater than 10 µg/L; 90 µg/L at KM-8. The long-term monitoring data (1991-2007) show no discernible trend for arsenic at this well. However, since installation

of the calcine cap in 2001, there does appear to be a downward trend in arsenic concentrations, though levels remain above the MCL. In order to determine whether the MCL will be met at this location (as well as others), it is recommended that the groundwater detection and reporting limits need to be reduced to less than the MCL for arsenic.

Tronox, Inc. purchased the property directly south of the facility that has been impacted by the contaminant plume. This action was taken to maintain control over land use of the impacted property and prevent potential exposure due to changes in land use.

7.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No.

7.4 Technical Assessment Summary

According to the data reviewed, the site inspection, and the interviews, the remedy has been constructed as intended by the ROD and ROD Amendment. There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy. Monitoring of the groundwater, however, reveals that RBCs are not being met and data trends are relatively flat or increasing in some cases such that remediation goals are not likely to be met for at least another 20 years.

No changes in standards or toxicity factors for the COCs except for arsenic have been made that would affect the protectiveness of the remedy, as was noted in the First Five-Year Review. The MCL for arsenic has been changed from 50 µg/L to 10 µg/L. Only one well (KM-8) currently exceeds the MCL, at 90 µg/L.

8.0 Issues

Table 4 Issues

Issue	Currently Affects Protectiveness (Yes/No)	Affects Future Protectiveness (Yes/No)
Concentrations of chemicals of concern in groundwater and surface waters remain above RBCs and are exhibiting either flat or upward trends.	No	Yes
The routine laboratory reporting limit for arsenic in groundwater is greater than the updated MCL.	No	Yes

9.0 Recommendations and Follow-up Actions

Table 5 Recommendations and Follow-Up Actions

Issue	Recommendations/ Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Follow-Up Action Affects Protectiveness (Yes/No)	
					Current	Future
Concentrations of COCs in groundwater and surface waters remain above RBCs and are exhibiting either flat or upward trends	Evaluate practicability of remedy in achieving cleanup goals	Tronox, Inc.	State/EPA	12/31/08	No	Yes
	Evaluate adequacy of current groundwater monitoring network for identifying the offsite migration of COCs	Tronox, Inc./EPA		9/30/08	No	Yes
	Assess whether current groundwater and surface water performance standards are still applicable	EPA		9/30/08	No	Yes
The routine laboratory reporting limit for arsenic in groundwater is greater than the updated MCL	Work with the laboratory providing analytical services to reduce the groundwater detection and reporting limits to less than the MCL for arsenic	Tronox, Inc.	State/EPA	3/30/08	No	Yes

10.0 Protectiveness Statement

A protectiveness determination of the remedy cannot be made until further information is obtained. Further information will be obtained by taking the following actions:

- Evaluate practicability of remedy in achieving cleanup goals;

- Evaluate adequacy of current groundwater monitoring network for identifying the offsite migration of COCs;
- Assess whether current groundwater and surface water performance standards are still applicable; and
- Work with the laboratory providing analytical services to reduce the groundwater detection and reporting limits to less than the MCL for arsenic.

It is expected that these actions will take approximately fifteen months to complete, at which time a determination of protectiveness will be made.

11.0 Next Review

The next Five-Year Review for the KMCC site is required by September 2012, five years from the date of this review.

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Attachment 1

Site Maps

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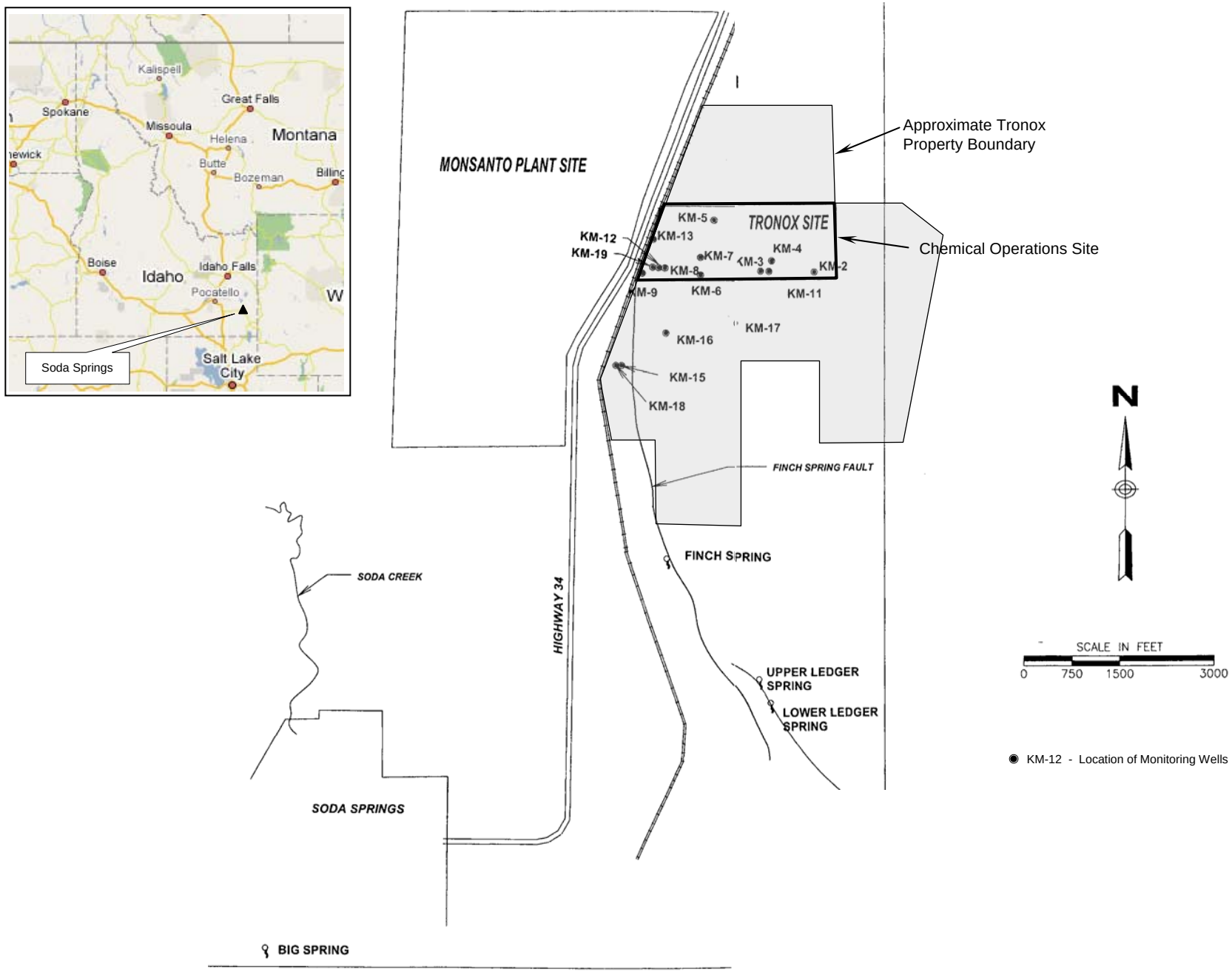

Figure 1 - Location Map

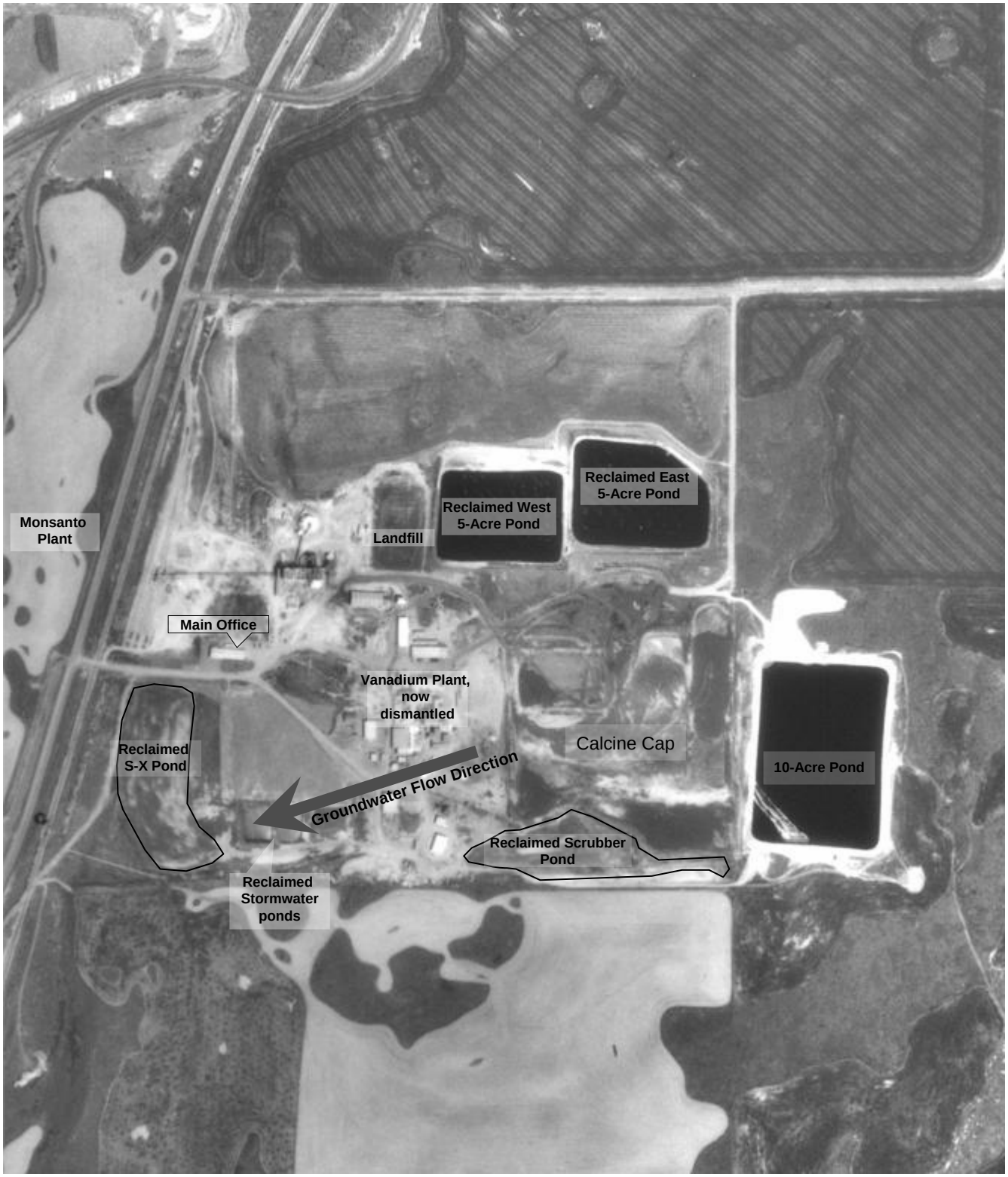

Photo - Sept 2000

Figure 2

Site Map – Tronox Facility Features

Attachment 2

Public Notification

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"Just a Cowboy."

And we couldn't resist adding this from a correspondence from Paul:

July 19, 2007 Caribou County Sun

EPA to Review Kerr-McGee Chemical Corp. Superfund Site Remedy

The U.S. Environmental Protection Agency (EPA) is doing the second Five-Year Review of the Kerr-McGee Chemical Corporation Superfund site, located on a 158-acre parcel of land one mile north of Soda Springs Idaho.

The review will insure that the waste cleanup put in place by the Kerr-McGee Corporation from 1997 to 2001 remains effective. The cleanup included the removal of two of the three waste ponds, disposal of 13,000 yards of pond sediment, and construction of an on-site landfill. Kerr-McGee stopped all liquid wastes draining into the calcine impounds and capped the calcine tailings in place in 2001. Ground water monitoring continues south of the Kerr McGee plant. Reviews are required at least every five years when a remedy leaves waste in place above levels that allow for unrestricted use and unlimited exposure.

How You Can Get Involved: EPA welcomes your participation during our review, in July and August, 2007. If you have information that may help EPA with the review, contact Tim Brincefield, EPA Project Manager, by phone at 206-553-2100 or toll free at 800-424-4372. Email: brincefield.timothy@epa.gov.
TTY users may call the Federal Relay Service at 800 877-8339 and give the operator Mr. Brincefield's phone number.

U.S. Environmental Protection Agency
1200 Sixth Avenue, ETPA-081
Seattle, Washington 98101-11128

Kerr-McGee Chemical Corp.
5-Year Review
Soda Springs, Idaho
July 2007

EPA to Review Kerr-McGee Chemical Corp. Superfund Site Remedy

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TTY users may call the Federal Relay Service at 800 877-8339 and give the operator Mr. Brincefield's number.

Attachment 3

List of Documents Reviewed

Global Environmental Technologies, LLC, Remedial Action, 2001 Annual Comprehensive Report of Groundwater Quality, Kerr-McGee Chemical LLC, Soda Springs, Idaho Facility, dated June 13, 2002.

Global Environmental Technologies, LLC, Remedial Action, 2006 Annual Comprehensive Report of Ground and Surface Water Quality, Kerr-McGee Chemical LLC, Soda Springs, Idaho Facility, dated October 22, 2006.

Global Environmental Technologies, LLC, Remedial Action, 2007 Summary of Monitoring Data through May 2007, Kerr-McGee Chemical LLC, Soda Springs, Idaho Facility, dated August 3, 2007.

U.S. Environmental Protection Agency, Record of Decision, Kerr-McGee, Soda Springs, dated September 28, 1995.

U.S. Environmental Protection Agency, Record of Decision Amendment, Kerr-McGee, Soda Springs, dated September 13, 2000.

U.S. Environmental Protection Agency, First Five-Year Review Report, Kerr-McGee Superfund Site, Soda Springs, Idaho, dated September 2002.

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Attachment 4

Site Inspection Checklist

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Site Inspection Checklist

I. SITE INFORMATION	
Site name: TRONOX SODA SPRINGS, IDAHO FACILITY (FORMERLY Kerr-McGee Chemical LLC	**Date of inspection: 07/25/07**
Location and Region: Soda Springs, Idaho REGION X	**EPA ID: IDD041310707**
Agency, office, or company leading the Five-Year Review: US Army Corps of Engineers - Seattle District	**Weather/temperature: Partly cloudy, hot, ~92 degrees F**

Remedy Includes: (Check all that apply)

fl Landfill cover/containment
fl Access controls
fl Institutional controls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☐ Other_____

X Monitored natural attenuation
☐ Groundwater containment
☐ Vertical barrier walls

Attachments: X Inspection team roster attached X Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** **Boyd Schvaneveldt** (Name) **Site Manager** (Title) **July 25, 2007** (Date)
   Interviewed X at site G at office G by phone **Phone no. 208-547-3331 ext 230**
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** **John S. Brown, P.G. dba Global Environmental Tech LLC** (Name) (Title) **July 25, 2007** (Date)
   Interviewed **X at site** G at office G by phone Phone no. 801-463-0902
   Problems, suggestions; ☐ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency __**IDEQ**
Contact __**Doug Tanner** **Regional Environmental Manager** **__7/07__** **208-236-6160**
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency ____**City of Soda Springs**_____
Contact _____ _____ ____**7/07**__ **(208) 547-2600**
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency ____**Caribou Co. Public Safety**
Contact _____ _____ __**7/07**____ **(208) 547-2583**
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency ___**Emergency Response**____
Contact _____ _____ ***7/07*** **(208) 547-2583**
_____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

4. **Other interviews** (optional) ☐ Report attached.

Last public meeting held in 2001.

Public notice for FYR published in local paper (Sun) in 7/19/07.

No tribal interest of local public groups.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

fl **O&M manual**	fl **Readily available**	☐ Up to date	☐ N/A
fl **As-built drawings**	X **Readily available**	☐ Up to date	☐ N/A
fl **Maintenance logs**	☐ Readily available	☐ Up to date	☐ N/A

Remarks__O&M is for the cap only. Covers inspection of the landfill cap. Landfill water level controlled by sump to concrete evaporation pond. No weeds or trees. IC controls in place.

2. **Site-Specific Health and Safety Plan** X **Readily available** ☐ Up to date ☐ N/A
☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☐ N/A
Remarks

3. **O&M and OSHA Training Records** X **Readily available** ☐ Up to date N/A
Remarks_____Site is an OSHA Star site since 1987. No reportable accidents.

4. **Permits and Service Agreements**

☐ Air discharge permit	G Readily available	G Up to date	**X N/A**
☐ Effluent discharge	☐ Readily available	☐ Up to date	**X N/A**
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	**X N/A**
☐ Other permits_____	☐ Readily available	☐ Up to date	**X N/A**

Remarks

5. **Gas Generation Records** ☐ Readily available ☐ Up to date **X N/A**
Remarks

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date **X N/A**
Remarks_____None, site is compacted.

7. **Groundwater Monitoring Records** **X Readily available** ☐ Up to date ☐ N/A
Remarks_____On site and available to review.

8. **Leachate Extraction Records** G Readily available ☐ Up to date **X N/A**
Remarks

9. **Discharge Compliance Records**

☐ Air	☐ Readily available	☐ Up to date	**X N/A**
☐ Water (effluent)	☐ Readily available	☐ Up to date	**X N/A**

Remarks

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date **X N/A**
Remarks_____Site is gated and a daily sign-in and sign-out log is maintained.

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
fl PRP in-house **X Contractor for PRP**
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other_____
_____

2. **O&M Cost Records**

☐ Readily available ☐ Up to date
fl Funding mechanism/agreement in place
Original O&M cost estimate **$1,000,000** ☐ Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____Nothing to report.
_____
_____
_____
_____
_____

V. ACCESS AND INSTITUTIONAL CONTROLS ☐ Applicable ☐ N/A

A. Fencing

1. **Fencing** ☐ Location shown on site map **X Gates secured** ☐ N/A

Remarks_____No damage observed.
_____

B. Other Access Restrictions

1. **Signs and other security measures** **X Location shown on site map** ☐ N/A

Remarks_____Signs on all gates. 24/7 operations.
_____

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs properly implemented **X Yes** G No ☐ N/A
Site conditions imply ICs being fully enforced **X Yes** G No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) **Tronox ICs in deed restrictions to property/Soda Springs city ordinances to hook up to city water**
Frequency ___**Continuous**_____
Responsible party/agency _____
Contact City of Soda Springs, ID _____ 7/25/07 **(208) 547-2600**
Name Title Date Phone no.

Reporting is up-to-date G Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met G Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☐ No ☐ N/A
Other problems or suggestions: ☐ Report attached

_____
_____
_____
_____

2. **Adequacy** **X ICs are adequate** ☐ ICs are inadequate ☐ N/A
Remarks_____
_____
_____

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map **X No vandalism evident**
Remarks_____
_____

2. **Land use changes on site** X N/A
Remarks_____
_____

3. **Land use changes off site** X N/A
Remarks_____Property ownership transferred to Tronox in 2004. No change in land use.
_____

VI. GENERAL SITE CONDITIONS

A. Roads ☐ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map **X Roads adequate** ☐ N/A
Remarks_____
_____

B. Other Site Conditions

Remarks _____ _____

VII. LANDFILL COVERS **X Applicable** ☐ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map **X Settlement not evident**
   Areal extent_____ Depth_____
   Remarks_____
   _____

2. **Cracks** ☐ Location shown on site map **X Cracking not evident**
   Lengths_____ Widths_____ Depths_____
   Remarks_____
   _____

3. **Erosion** ☐ Location shown on site map **X Erosion not evident**
   Areal extent_____ Depth_____
   Remarks_____
   _____

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

5. **Vegetative Cover** **X Grass** **X Cover properly established** ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks**_____No Trees, spraying for weeds required.**
   _____

6. **Alternative Cover (armored rock, concrete, etc.)** X N/A
   Remarks_____
   _____

7. **Bulges** ☐ Location shown on site map **X Bulges not evident**
   Areal extent_____ Height_____
   Remarks_____
   _____

8. **Wet Areas/Water Damage** **X Wet areas/water damage not evident**
   ☐ Wet areas ☐ Location shown on site map Areal extent_____
   ☐ Ponding ☐ Location shown on site map Areal extent_____
   ☐ Seeps ☐ Location shown on site map Areal extent_____
   ☐ Soft subgrade ☐ Location shown on site map Areal extent_____
   Remarks_____
   _____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map **X No evidence of slope instability**
   Areal extent_____
   Remarks_____Nothing steeper than 3/1. Mostly 6/1.
   _____

B. Benches ☐ Applicable **X N/A**

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map **X N/A or okay**
   Remarks_____

2. **Bench Breached** ☐ Location shown on site map **X N/A or okay**
   Remarks_____

3. **Bench Overtopped** ☐ Location shown on site map **X N/A or okay**
   Remarks_____

C. Letdown Channels ☐ Applicable **X N/A**

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map **X No evidence of settlement**
   Areal extent_____ Depth_____
   Remarks_____

2. **Material Degradation** ☐ Location shown on site map **X No evidence of degradation**
   Material type_____ Areal extent_____
   Remarks_____

3. **Erosion** ☐ Location shown on site map **X No evidence of erosion**
   Areal extent_____ Depth_____
   Remarks_____

4. **Undercutting** ☐ Location shown on site map **X No evidence of undercutting**
Areal extent_____ Depth_____
Remarks_____
_____

5. **Obstructions** Type_____ **X No obstructions**
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____
_____

6. **Excessive Vegetative Growth** Type_____
fl No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks_____
_____

D. Cover Penetrations ☐ Applicable **X N/A**

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
fl N/A
Remarks_____**6-inch landfill sump in good conditions**_____
_____

2. **Gas Monitoring Probes**
☐ Properly secured/locked☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance **X N/A**
Remarks_____
_____

3. **Monitoring Wells** (within surface area of landfill)
fl Properly secured/locked X Functioning X Routinely sampled X Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks____Dedicated pumps installed in all wells.
_____

4. **Leachate Extraction Wells**
☐ Properly secured/locked☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance **X N/A**
Remarks_____
_____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed **X N/A**
Remarks_____
_____

E. Gas Collection and Treatment ☐ Applicable **fl N/A**

1. **Gas Treatment Facilities**
   ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____
   _____

2. **Gas Collection Wells, Manifolds and Piping**
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____
   _____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   ☐ Good condition ☐ Needs Maintenance ☐ N/A
   Remarks_____
   _____

F. Cover Drainage Layer **X Applicable** ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning **X N/A**
   Remarks_____
   _____

2. **Outlet Rock Inspected** ☐ Functioning **X N/A**
   Remarks_____
   _____

G. Detention/Sedimentation Ponds ☐ Applicable **X N/A**

1. **Siltation** Areal extent_____ Depth_____ **X N/A**
   ☐ Siltation not evident
   Remarks_____
   _____

2. **Erosion** Areal extent_____ Depth_____
   ☐ Erosion not evident
   Remarks_____
   _____

3. **Outlet Works** ☐ Functioning ☐ N/A
   Remarks_____
   _____

4. **Dam** ☐ Functioning ☐ N/A
   Remarks_____
   _____

H. Retaining Walls ☐ Applicable **X N/A**

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____
   _____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
   Remarks_____
   _____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable **X N/A**

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
   ☐ Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____
   _____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

4. **Discharge Structure** ☐ Functioning ☐ N/A
   Remarks_____
   _____

VIII. VERTICAL BARRIER WALLS ☐ Applicable **X N/A**

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

2. **Performance Monitoring** Type of monitoring_____
   ☐ Performance not monitored
   Frequency_____ ☐ Evidence of breaching
   Head differential_____
   Remarks_____
   _____

IX. GROUNDWATER/SURFACE WATER REMEDIES G Applicable **X N/A**

A. Groundwater Extraction Wells, Pumps, and Pipelines G Applicable X N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   G Good condition G All required wells properly operating G Needs Maintenance **X N/A**
   Remarks_____
   _____
   _____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   G Good condition G Needs Maintenance
   Remarks_____
   _____

3. **Spare Parts and Equipment**
   G Readily available G Good condition G Requires upgrade G Needs to be provided
   Remarks_____
   _____

B. Surface Water Collection Structures, Pumps, and Pipelines G Applicable X N/A

1. **Collection Structures, Pumps, and Electrical**
   G Good condition G Needs Maintenance
   Remarks_____
   _____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   G Good condition G Needs Maintenance
   Remarks_____
   _____

3. **Spare Parts and Equipment**
   G Readily available G Good condition G Requires upgrade G Needs to be provided
   Remarks_____
   _____

C. Treatment System ☐ Applicable **X N/A**

1. **Treatment Train** (Check components that apply)
   ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
   ☐ Air stripping ☐ Carbon adsorbers
   ☐ Filters_____
   ☐ Additive (*e.g.*, chelation agent, flocculent)_____
   ☐ Others_____
   ☐ Good condition ☐ Needs Maintenance
   ☐ Sampling ports properly marked and functional
   ☐ Sampling/maintenance log displayed and up to date
   ☐ Equipment properly identified
   ☐ Quantity of groundwater treated annually_____
   ☐ Quantity of surface water treated annually_____
   Remarks_____
   _____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   fl N/A ☐ Good condition ☐ Needs Maintenance
   Remarks_____
   _____

3. **Tanks, Vaults, Storage Vessels**
   ☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance
   Remarks_____
   _____

4. **Discharge Structure and Appurtenances**
   ☐ N/A ☐ Good condition ☐ Needs Maintenance
   Remarks_____
   _____

5. **Treatment Building(s)**
   fl N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair
   ☐ Chemicals and equipment properly stored
   Remarks_____
   _____

6. **Monitoring Wells** (pump and treatment remedy)
   ☐ Properly secured/locked☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ All required wells located ☐ Needs Maintenance **X N/A**
   Remarks_____
   _____

D. Monitoring Data

1. Monitoring Data
   fl Is routinely submitted on time **X Is of acceptable quality (STL Denver)**

2. Monitoring data suggests:
   fl Groundwater plume is effectively contained X Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

fl Properly secured/locked	**X Functioning**	**X Routinely sampled**	**X Good condition**
fl All required wells located	☐ Needs Maintenance		☐ N/A

Remarks_____

_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

Purpose is to contain contaminant plume. Actions taken to date have had a dramatic impact on GW concentrations. Need to continue monitoring to track decline of well concentrations in off site wells and surface water. Additional evaluation of "flattening" groundwater trends is warranted.

_____
_____
_____
_____
_____
_____
_____

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

No issues identified.

_____
_____
_____
_____
_____
_____
_____
_____
_____

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

No issues identified.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Vanadium plant removed. Planned removal of 10-acre pond and consolidation in 5 acre pond landfill (2-acre RCRA compliant) should further reduction of COC in GW.

Attachment 5

Photos Documenting Site Conditions

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10-Acre Pond Looking North

Calcine Cap

Infiltration Pond

Location of Former Vanadium Building

Monsanto Plant West of Kerr-McGee (Tronox) Site

Off-Site Well Looking South